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EFFECT OF TIME BEFORE LIFTING IRRIGATION OF FRIGO STRAWBERRY TRANSPLANTS ON THEIR QUALITY AND PRODUCTIVITY

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ABSTRACT

The experiment was conducted in 2005/2006 and 2006/2007 to study the effect of irrigation time before lifting the transplants from the nursery on transplants quality and yield of strawberry after cold storage. The period between the last irrigation time and lifting the transplants was on the lifting day , one and two days before lifting . The transplants were lifted from the nursery and stored on the same day for 9 months. Transplants after storage were planted in the field to evaluate its growth and yield after the cold storage.

Data indicated that the highest values of dry matter of roots and crowns before and after cold storage, leaf number and area, early and total yield were obtained from the transplants that irrigated 2 days before lifting while the lowest values were obtained from that transplants supplied with water on the lifting day.

Keywords: Irrigation - Strawberry- Storage- Frigo transplants –decay- vegetable growth– Yield - Chemical component –Desert conditions.

INTRODUCTION

In Egypt, frigo transplants are cold stored for long time (8 months approximately), after this long period of storage a considered number of transplants are corrupted in spite of the low temperature. There are many factors affecting this corruption, *i.e,.* mother plant source, nursery soil infection by the pathogens, improper package, improper package filling, transplant infection during lifting and handling. Also, there are some factors related to the transplant itself as transplant size and water content of the transplants (irrigation before lifting the transplant from the nursery or the rainfall during lifting the transplants). All of these previous factors affect only the quality of the transplants after the storage period, percent of stand of the transplants, their growth and subsequently their yield in spite of its healthy appearance.

Lefevre *et al.* (1991) indicated that the relationship between moisture loose from bare-root 2-year-old seedlings of *Picea pungens* var. *glauca* (cultivars Misty Blue and San Juan) and survival percent and performance after extended storage at 0C°. Depending on treatment, weight loose of seedlings varied from 0 to 60% and seedling survival ranged from 0 to 100%.

In a study conducted by Genc (1996) on plant quality and performance in oriental spruce, best water potential, survival and growth were obtained from transplants watered after lifting.

Gambardella *et al.* (2006) indicated that wash strawberry transplants prior to cold storage negatively affected the starch content and the percentage of plants that established.

The present study was therefore conducted to study the influence of the last time of irrigation before lifting the transplants from the nursery on growth and yield of strawberry.

MATERIALS AND METHODS

This work was conducted during 2005/2006 and 2006/2007 seasons to study the influence of the last irrigation before lifting the strawberry transplants from the nursery on growth, chemical composition and yield. The last irrigation treatments of the transplants in the nursery were on the same day of lifting the transplants, one and two day before lifting. Montakhab strawberry cultivar was used in the experiment. Transplant samples were selected randomly from each replicate to assess its characteristics before cold storage. Complete randomized design with three replicates was used.

The nursery soil had PH of 7.5 and Ec 1.5 of dm^S/cm. Soil moisture percentage on the lifting day is arranged in Table A, mechanical and chemical properties of nursery soil are shown in Table B.

Table A: Soil moisture percentage.

	Days before lifting		
Season	2 days	1 day	lifting day
2005/2006	1.72%	1.85%	2.10%
2006/2007	1.63%	1.76%	2.07%

Table B: Nursery soil mechanical and chemical analyses.

Mechanical Analyses		Chemical Analyses (mg/100g)			
		Soluble Cations		Soluble Anions	
Sand	93.0%	Ca^{++}	6.7	HCO_3^-	1.8
Silt	2.9%	Mg^{++}	4.3	Cl^-	6.3
Clay	3.5%	Na^+	2.5	So_4^{--}	7.2
Texture	Sandy	K^+	1.6	CO_3^-	Nil
Organic mater	0.5%				

Conventional carton paper boxes were used as storage package (56 x 30 x 26 cm) with 2.8% total ventilation area. The transplants were placed loosed in plastic bags and transferred to the refrigerator on the same day of lifting, i.e., January 15 and 20 in the first and second seasons, respectively, and held at-2 C^O and 90% relative humidity until transplanting date (15 th and 20 th of October 2005 and 2006, respectively).

The transplants were set up in the field at Al- Noubarya – El Behaira governorate on ridges of 1m width at 20 cms apart, Experimental plot area was 10.5 m^2(3 ridges of 3.5 m long). Drip irrigation system was used to irrigate the plants with boundary water. The soil was sandy with PH of 7.5 and Ec of 1.8 dm^S/cm.

Agricultural practices, *i.e.*, irrigation, fertilization, weed and disease control, were applied as the recommended for strawberry.

Data recorded:

The following characteristics were determined in the transplants before and at the end of cold storage: root fresh weight and dry mater percentage, crown fresh weight and dry matter percentage, total carbohydrate and starch in both root and crown. In addition, the decayed transplants were determined after storage.

One month after transplanting, the following characters were determined: transplant stand percentage, plant fresh weight, number of leaves per plant, total plant leaflet area (Koller, 1972). At the end of the growing season the early and total yield were detdrmind.

Analytical methods:

Dry mater percentage of transplant root and crown were determined as described in A.O.A.C.(1975)

Total carbohydrates in the transplant crown and root dry matter were estimated spectrophotometerically as the method described by Smith *et al.* (1964).

Starch content of crown and root were determined in the dry matter according to champ *et al,*(1997)

Soil physical analysis was carried out as described by Piper (1950) and chemical analysis according to Jakson (1958)

Statistical analysis: Obtained data were subjected to the statistical analysis according to Thomas and Hills (1975). At 5% degree of freedom, least significant differences between the means were determined.

RESULTS AND DISCUSSION

A: Transplant characters before storage.

Data in Table 1 clear that time of irrigation before lifting did not affect significantly root number, length, fresh weight, carbohydrates and starch content during the two seasons. Whereas dry matter percent was significantly increased when last irrigation was at two days before lifting compared to other treatments.

Table 1: Effect of the time between the last irrigation and lifting the strawberry transplants from the nursery on root and crown characters before cold storage in 2005/2006 and 2006 /2007 seasons.

Irrigation time	Root length (cm).	Root No.	Root F. W. (g.)	Root D. M %	Crown F. w (g.)	Crown D. M %	Root Carbo. %	Root starch %	Crown Carbo. %	Crown Starch %
	2005 / 2006 season									
On lifting day	19.93	28.80	6.98	40.05	5.23	37.60	48.13	22.06	52.37	24.60
One day before	19.90	27.80	6.64	41.00	5.24	38.24	47.80	21.76	52.36	24.50
Two day before	19.27	27.13	6.33	43.20	5.13	39.55	48.53	21.37	52.61	24.20
L.S.D	N.S	N.S	N.S	1.45	N.S	1.49	N.S	N.S	N.S	N.S
	2006 / 2007 season									
On lifting day	22.33	30.82	7.08	38.04	5.47	35.72	48.06	21.90	52.83	24.75
One day before	22.29	29.75	6.75	38.95	5.57	36.32	47.76	22.37	52.27	24.73
Two day before	21.58	29.03	7.44	41.04	5.58	37.57	47.90	21.37	52.77	24.33
L.S.D	N.S	N.S	N.S	1.38	N.S	1.42	N.S	N.S	N.S	N.S

This result may be due to the influence of irrigation on transplant water content as well as dry mater percent.

B: Transplant characters after storage.

At the end of storage, transplants that irrigated on the lifting day showed the highest percent of decay followed by one day before lifting, while those irrigated two days before lifting had the lowest percent (Table 2).

This result may be due to the higher water content in the transplants that irrigated on the same day of lifting from the nursery which encourage the pathogens to develop (Karim *et al.*,2006). In addition the higher water content may cause mechanical damage from the ice crystal (Warmund *et al.*, 1993) Decreasing the time between the last irrigate and lifting the transplant decreased root and crown dry mater percent significantly after storage (Table 2). These results were true in the two seasons. The reduction in the dry matter may be due to the high rates of transpiration and metabolism according to water content difference (King *et al.*, 1993)

Data in table 2 also indicate that time of irrigation before lifting the transplants did not affect significantly carbohydrate and starch percent of root and crown after storage in both seasons under study.

Table 2: Effect of the time between the last irrigation and lifting strawberry transplants from the nursery on decay, root and crown dry matter, carbohydrate and starch after storage in 2005/2006 and 2006/ 2007 seasons.

Irrigation time	Decay %	Root D. M %	Crown D. M %	Root Carbo %	Root Starch %	Crown Carbo. %	Crown Starch %
	2005 / 2006 season						
On lifting day	18.66	37.64	35.34	41.96	17.10	43.33	17.30
One day before	17.00	39.16	36.52	42.90	18.30	42.47	17.20
Two day before	15.33	41.47	37.97	42.07	17.96	42.53	17.00
L.S.D	3.19	1.38	1.42	N.S	N.S	N.S	N.S
	2006 / 2007season						
On lifting day	19.67	35.76	33.62	42.03	17.50	42.77	17.24
One day before	18.00	37.20	35.52	42.73	18.23	42.90	17.23
Two day before	15.33	39.40	37.82	42.07	18.16	42.27	17.53
L.S.D	4.10	1.31	1.25	N.S	N.S	N.S	N.S

C: Field performance evaluation.

Transplant stand percent.

Table 3 indicated that, the highest percent of transplant stand was obtained by irrigation the nursery two days before lifting the transplants followed by one day, while the lowest percent was obtained by irrigation the nursery on the lifting day. These results were true in both seasons. This may be due to the higher dry matter content of the transplants that were irrigated two days before lifting. This result is in harmony with also those of Gambardella *et al*, (2006).

Plant growth.

Plant fresh weight did not differ significantly. This may be due to the effect of time between the last irrigation and lifting the transplant (Table 3).

Whereas leaf number and area were increased by prolonging the period from the last irrigation and lifting the transplants from the nursery. This relationship between the irrigation and vegetative growth was confirmed by Genc 1996.

Table 3: Effect of the time between the last irrigation and lifting strawberry transplants from the nursery on stand percent, plant growth one month after planting, early and total yield in 2005/2006 and 2006/2007 seasons

Irrigation time	Stand %	Plant fresh weight (g.)	Leaf No./ plant	Leaf total area (cm^2)	Early yield (Ton/fed.)	Total yield (ton/fed.)
	2005 / 2006 season					
On lifting day	85.00	63.53	5.67	1269	0.472	5.195
One day before	86.67	62.45	6.13	1380	0.490	5.514
Two day before	89.17	63.44	6.27	1423	0.547	5.767
L.S.D	3.79	n.s	0.56	127	0.033	0.367
	2006 I 2007season					
On lifting day	84.17	75.60	6.80	1384	0.515	5.332
One day before	85.83	74.31	7.40	1504	0.534	5.899
Two day before	88.33	75.49	7.60	1551	0.597	6.027
L.S.D	2.88	n.s	0.76	140	0.035	0.391

Early and total yield.

Data presented in Table 3 clear that transplants irrigated two days before lifting from the nursery produced plants which gave the highest early and total yield, the obtained results held true in both seasons. This result may be due to the good vegetative growth of these plants and its highly content of dry matter after storage (Bish *et al.*, 2000)

REFERENCES

AOAC (1975). Official Methods of Analysis of the "Association of Official Agricultural Chemists" 10th ed. Published by Association of Official Agricultural Chemists , Washington , D.C. 832.

Bish, E.B.; D. J. Cantliffe and C.K. Chandler (2000). Strawberry daughter plant size alters transplant growth and development. Acta Horticulturae, 533:121-125.

Champ, M.; L. Noah; G. Loizeau and F. Kozlowski (1997). Complex carbohydrates in foods: definition, functionality, and analysis. Cho, S.; L. Prosky and, M. Dreher (eds.) Marcel Dekker Co.

Gambardella, M.; V. Diaz ; P. Troncoso ; I. Holmes and R. Pertuze (2006). Evaluation of cold-store strawberry plant quality according to different postharvest treatments. Acta Horticlturae. International Society for Horticultural Science, 708: 323-327.

Genc, M. (1996). Effects of watering after lifting and exposure before planting on plant quality and performance in oriental spruce. Annales-des-Sciences-Forestieres, 53(1): 139-143.(C.F. CAB Abstracts).

Jakson, M.L.(1958) Soil Chemical Analysis. Printce holl, Inc., Englewood Cliffs, New Jersey, USA. 498p.

Karim, M. R.; M. A. Rahim; G. A.Fakir and H. R.Anwar (2006). Effect of storage containers, moisture contents and storage conditions on seed health of onion. International Journal of Sustainable Agricultural Technology, 2(6): 9-13.

King, G. A; P.L. Hurst; D. E. Irving and R. E. Lill (1993). Recent advances in the postharvest physiology, storage and handling of green asparagus. Postharvest-News-and-Information, 4 (3): 85-89. (C.F. Horticultural Abstracts, 063:06711)

Koller , H. R. (1972). Leaf area - Leaf weight relationship in the soybean . Crop Sci. , 12 : 180 - 183 .

Lefevre, R.E; A.C. Cameron and N.C. Peterson (1991). Influence of moisture loss during storage on new growth of conifer seedlings. Journal of Environmental Horticulture. 9: 2, 92-96

Piper, C.S. (1950). Soil and Plant Analysis. Univ. Inter. Sci. publishers, Inc. New York, Adelaide,pp 258-272.

Smith, D. ; G. M. Polsen and C. A. Roguse (1964) Extraction of total available carbohydrates from grass and legumes tissues. Plant Physiol., 39 : 960-962.

Thomas, M. L. and F. G. Hills (1975). Statistical Methods In Agric. Research, Univ. of California , Davis 95616 2nd printing ,pp. 67-74 .

Warmund, M. R; J. L. Maas and G.J. Galletta (1993). Recovery from extracellular freezing in strawberry crowns. 2 nd International Strawberry Symposium, Beltsville, Maryland, USA, 13-18 Sep. 1992. Acta Horticulturae, 348: 334-338.

أثر موعد الرى قبل التقليع على جودة و محصول شتلات الفراولة المجمدة

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أقيمت تجربتان خلال موسمى٢٠٠٥/٢٠٠٦ و ٢٠٠٦/٢٠٠٧ لدراسة تأثير الفترة بين الرى وتقليع الشتلات من المشتل على جودة و محصول شتلات الفراولة بعد التخزين المبرد. كانت الفترة بين الرى و التقليع فى نفس يوم التقليع ، يوم واحد و ومان قبل التقليع وقد تم تخزين الشتلات فى نفس يوم التقليع لمدة 9 شهور و بعد انتهاء فترة التخزين زرعت الشتلات فى الحقل لتقييم نموها ومحصولها.اظهرت البيانات المتحصل عليها تفوق الشتلات التى تم ريها قبل التقليع بيومين فى صفات المادة الجافة فى الجذور و التيجان قبل وبعد التخزين ، وكذلك تفوقت نفس المعاملة بعد الزراعة فى عدد و مساحة الاوراق و المحصول المبكر و الكلى.

قام بتحكيم البحث

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